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SPECIFICATION FOR PLASTICS BEAKERS

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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SPECIFICATION FOR PLASTICS BEAKERS

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SPECIFICATION FOR PLASTICS BEAKERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 February 1982, after the draft finalized by the Laboratoryware and Related Apparatus Sectional Committee had been approved by the Chemical Division Council.

0.2 A number of laboratories in India, as in many other countries, are using beakers made of plastics in day to day work. However, before using such beakers for strong acids or alkalis, oxidizing agents or non-aqueous liquids, or at high temperature, users should satisfy themselves, either by laboratory tests or by reference to the manufacturer or supplier that these are suitable for such applications. Accordingly, keeping some of these aspects in view, this standard has been prepared to provide details regarding nominal capacities, quality requirements and methods of tests to have an idea of their suitability for common use.

0.3 The Committee while preparing this standard felt that fabricated items or used raw materials should not be re-used in the manufacture of plastic beakers (*see* **4.1.1** and **4.3.2**).

0.4 In this standard the nominal capacities of beakers have been chosen from those prescribed in IS : 2619-1971* in keeping, as far as possible, with the current production and use in the country and outside. Further, in the formulation of this standard assistance has also been derived from ISO 7056-1981 ' Laboratory plasticware — Beakers ', issued by the International Organization for Standardization (ISO).

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for plastics graduated and ungraduated beakers for laboratory use.

---

*Specification for glass beakers (*first revision*).

†Rules for rounding off numerical values (*revised*).

2. CAPACITIES

2.1 Nominal Capacities — Plastics beakers shall have the following nominal capacities:

25, 50, 100, 150, 250, 500, 1 000, 2 000 and 5 000 ml.

2.2 Overflow Capacities — The overflow capacities of beakers shall be at least 20 percent greater than the nominal capacities.

3. TYPES

3.1 Beakers shall be of two types, namely, non-tapered and tapered (*see* **4.2.2**).

4. REQUIREMENTS

4.1 Material — Beakers shall be rigidly constructed of generally non-brittle transparent or translucent plastics material of suitable chemical and thermal properties and shall be free from moulding defects and stresses.

NOTE — The materials generally used for manufacture of beakers are polypropylene, methyl pentane polymer and taflon.

4.1.1 Beakers shall be fabricated only from synthetic raw materials. These shall be free from any colours, pigments and dyes etc.

4.1.2 *Resistance to Extraction of Ionic Material by Water at 60°C* — When tested in accordance with the procedure prescribed in Appendix A the beakers shall give an aqueous extract free from suspended matter, and the difference between its conductivity and that of original water used for extraction shall not exceed the values given below:

Nominal Capacity ml	*Conductivity Difference* µS/m
25	1 000
50	800
100	700
250	500
500	400
1 000	300
2 000	250
5 000	150

NOTE — The equivalent in the conductivity of water containing approximately 1 ppm of sodium chloride is 200 µS/m.

4.2 Construction and Finish — Beakers shall be regular in shape and smoothly finished. They shall be symmetrical (except for the spout) about the axis which shall be perpendicular to the base.

4.2.1 *Base* — The base shall enable the beaker to stand vertically on a plane horizontal surface without rocking or spinning.

NOTE — The base shall be as less concave as possible. In any case the centre of concave base should not be more than 2 mm from the plane otherwise it may pose difficulty in removing precipitates or in magnetic stirring.

4.2.2 *Side* — The sides of beakers may be slightly tapered to ensure mould release in manufacture; in which case the body shall form a right frustum of a cone, the apex angle of which shall be below the base of the beaker. This angle (defined as the angle included between the sides), shall be the minimum required for mould release in the case of non-tapered beakers and shall not exceed 10° in the case of tapered beakers. The sides of the beakers shall be slightly flared near the brim in a smooth and regular curve internally.

4.2.3 *Brim* — The edge of the brim shall be smooth and finished in a plane parallel to the base. The diameter of the brim shall be greater than the average external diameter of the body by at least 10 percent.

4.2.4 *Spout* — The spout shall be so shaped that when the beaker is filled with water to its nominal capacity, the water may be poured in a regular stream clear of the side of the beaker. The spout shall be at right angles to the radius drawn from the mid-point of the graduation lines and shall be on the left-hand side when the beakers' graduation lines face the user. The spout shall not extend above the plane of the brim of the beaker.

4.2.4.1 The formation of spout shall be incorporated in the mould itself.

4.2.5 Except when the beakers are opaque they shall be graduated and figured on the outside.

4.3 Dimensions — Recommended dimensions for plastics beakers are given in Table 1.

4.3.1 *Radius at the Base* — The internal radius at the junction between the base and the side of the beaker shall be not less than 3 mm.

4.3.2 *Wall Thickness* — The wall thickness (*see* Table 1) and brim design shall be such that, when the beaker is tested for flexibility in accordance with the method prescribed in Appendix B, the outside diameter at the brim shall not decrease by more than 10 percent.

TABLE 1 RECOMMENDED DIMENSIONS FOR PLASTICS BEAKERS

(*Clause* 4.3)

SL No. (1)	NOMINAL CAPACITY (2) ml	EXTERNAL DIAMETER AT THE SIDES (3) mm	OVERALL HEIGHT (4) mm	WALL THICKNESS *Min* (5) mm
i)	25	35	40	1·5
ii)	50	45	45	1·5
iii)	100	50	75	1·5
iv)	250	75	80	2
v)	500	90	115	2
vi)	1 000	110	140	2
vii)	2 000	140	175	2
viii)	5 000	195	220	2·5

5. GRADUATION AND FIGURING FOR GRADUATED BEAKERS

5.0 General — The graduation lines, figuring and inscriptions shall be engraved on the beakers.

5.1 Graduation Lines — The graduation lines shall be of uniform thickness and shall lie in a plane perpendicular to the axis of the beaker. The error in graduation at any graduation line shall not exceed ±·5 percent of the indicated capacity.

5.1.1 The highest graduation line shall indicate the nominal capacity and the lowest graduation line shall indicate 20 percent of the nominal capacity.

5.1.2 The interval between the highest and the lowest graduation lines shall be divided into four equal parts and figured in intervals of capacities as follows:

Nominal Capacities, ml	25,	50,	100,	250,	500,	1 000,	2 000,	5 000.
Figured Intervals, ml	5,	10,	20,	50,	100,	200,	500,	1 000.

5.1.3 The intervals between the figured graduations shall be further divided into equal parts by shorter un-figured graduation lines indicating volume intervals as follows:

Nominal Capacities, ml	25,	50,	100,	250,	500,	1 000,	2 000,	5 000.
Volume Intervals, ml	1,	2·5,	5,	10,	20,	50,	100,	200.

5.1.4 The figured graduation lines shall extend at least one-fifteenth of the way round the mean circumference of the beaker, but in any case shall not be less than 8 mm long.

5.1.5 The right-hand ends of the graduation lines, shall lie on a line coplanar with the axis of the beaker; this line may be marked.

5.2 Figuring — The figuring shall be on the right-hand side of the graduation line and its position shall be such as to enable the value corresponding to each graduation line to be readily identified.

5.2.1 The figures indicating the nominal capacity of the beaker shall be adjacent to the top graduation line, shall be more prominent than the other figures and shall be followed by the inscription 'ml' (*see* Fig. 1).

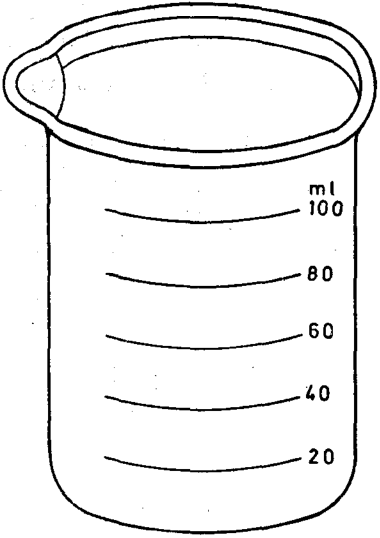

FIG. 1 PLASTICS BEAKER SHOWING GRADUATION AND FIGURING

6. MARKING AND PACKING

6.1 Marking — Beakers shall be engraved with the following:

a) The nominal capacity in ml; and

b) Name of the manufacturer or his recognized trade-mark, if any.

6.1.1 The following information shall be provided either on each beaker packed in polyethylene or paper bag or on the label on the primary packing boxes:

a) Name of the material from which the beaker is made, for example, ' pp ', and the manufacturer's recommended safe maximum temperature for short term use (several hours) in contact with materials that do not attack the plastic, for example, for polypropylene:

' pp 130°C *max* '

NOTE — The temperature in the example is merely intended to indicate a marking and does not represent any particular grade of plastics materials.

b) The words ' No Flame '.

6.1.2 The manufacturer shall also provide a catalogue giving details of physicochemical properties of the raw materials used for manufacture of beaker and the detergent to be used for washing (*see* **A-1.1**).

6.1.3 The beakers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6.2 Packing — Each beaker shall be packed as per **6.1.1.** The number of such individual beakers packed in a card board box shall be indicated on the label.

7. SAMPLING

7.1 Representative samples of beakers shall be drawn and adjudged for conformity to this standard as prescribed in IS : 4426-1967*.

---

*Methods of sampling laboratory glassware and medical glass instruments.

APPENDIX A

(*Clause* 4.1.2)

TEST FOR IONIC MATERIAL EXTRACTED BY WATER AT 60°C

A-1. APPARATUS AND SOLUTIONS

A-1.1 Detergent Solution — As recommended by the manufacturer.

A-1.2 De-ionized Water — The conductivity of which is less than 200μS/m.

A-1.3 Water Bath — Maintained at 60 ± 2°C.

A-1.4 Watch Glasses — Made of borosilicate glass, sizes approximate to the beakers under test.

A-1.5 Conductivity Meter — Suitable for measurement of the electrical conductivity of water.

A-2. PROCEDURE

A-2.1 Thoroughly wash each beaker under test with hot water and detergent solution (*see* **A-1.1**) then rinse well with hot water followed by cold water and finally with liberal quantities of de-ionized water till the conductivity of the final rinse is the same as of the original de-ionized water. Fill each beaker to its nominal capacity with de-ionized water (*see* **A-1.2**) and place in water bath maintained at 60 ± 2°C to the depth of the water level in the beaker. Cover each beaker with a clean watch glass and allow it to stand for 3 h.

A-2.1.1 Remove each beaker from the water bath and allow the contents to cool to 27°C. Measure the electrical conductivity of each extract by the method prescribed in **9** of IS : 3025-1964*, and deduct from the value of conductivity of the original water (also measured at 27°C) used to prepare the extract. Note the difference in conductivity in microsiemens.

---

*Methods of sampling and test (physical and chemical) for water used in industry.

APPENDIX B

(*Clause* 4.3.2)

FLEXIBILITY TEST FOR PLASTICS BEAKERS

B-1. APPARATUS

B-1.1 The general arrangement of the apparatus is shown in Fig. 2, and the following items are required

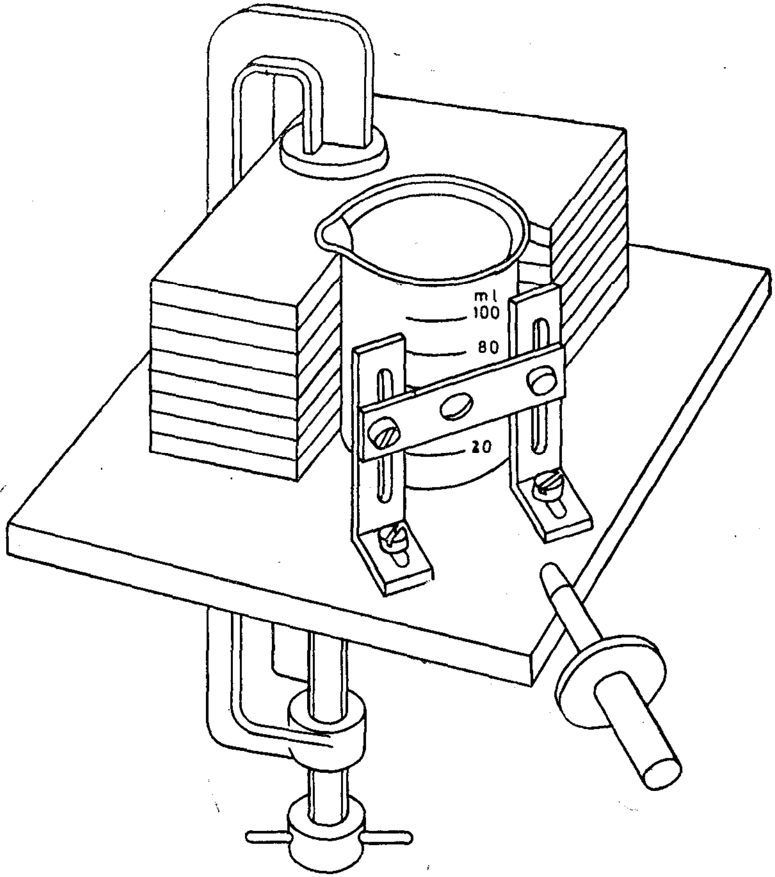

FIG. 2 APPARATUS FOR FLEXIBILITY TEST FOR PLASTICS BEAKERS

B-1.1.1 *Square Blocks of Wood* — Up to 15 in number, each 20 mm thick having a square with up to 110 mm sides cut from one corner and not exceeding one-quarter of the original block.

B-1.1.2 *A Guide for the Test Pin* — Consisting of a stout plate with a 13 mm hole, suitably mounted so that it is adjustable in distance (from 65 mm to 275 mm) from the inside corner of the blocks and adjustable in height (from 25 mm to 220 mm).

B-1.1.3 *Thermometer* — Reading from 0°C to 100°C and graduated at each degree celsius (*see* Schedule Mark 13 of IS : 2480-1974*).

B-1.1.4 *Outside Calipers* — Opening up to 250 mm.

B-1.1.5 *G-Clamp*

B-2. PROCEDURE

B-2.1 Stack sufficient wooden blocks to bring the highest one just below the brim of the beaker to be tested. Adjust the blocks so that each touches the beakers at two points and clamp the stack to the working surface. Adjust the brackets bearing the guide such that the test pin, when inserted through the hole, will touch the beaker at a height equal to three-quarters of the total height of the beaker. Further adjust the brackets bearing the guide such that the guide is perpendicular to the plane of the axis of the beaker and the inside corners of the blocks and is fixed 20 mm from the beaker.

B-2.2 Using the calipers, measure the outside diameter (d_1 mm) of the brim of the beaker in the direction the force is to be applied by the test pin.

B-2.3 Fill the beaker to its nominal capacity with water at 60 ± 2°C. Insert the test pin through the guide and apply a steady force of 30 N, as shown by the force indicator of the test pin, horizontally and towards the axis of the beaker. Approximately 1 min after applying the force and while still maintaining it, remeasure the outside diameter (d_2 mm) as described in **B-2.2**. Remove the test pin. Check the temperature of the water, if it is different from 60 ± 2°C, reject the readings and repeat from **B-2.2**.

B-2.4 Rotate the beaker 90° and repeat from **B-2.2**.

B-3. Express the result as percentage change in the diameter

$$= \left(1 - \frac{d_2}{d_1} \right) \times 100$$

and report the higher of the two values derived before and after rotation of the beaker.

---

*Specification for solid-stem general purpose glass thermometers (*first revision*).

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous Intensity	candela	cd
Amount of substance	mole	mole

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2